

Claims

TAP11 Rec'd PCT/PTO 10 AUG 2006

1. An exhaust gas cleaning catalyst comprising on a honeycomb carrier a catalytic coating, said honeycomb carrier having an upstream end and a downstream end and a plurality of flow channels running from the upstream end to the downstream end, wherein the catalytic coating comprises at least one catalytically active precious metal component which exhibits a <sup>continuously</sup> ~~varying~~ concentration profile along the axis of the honeycomb carrier wherein the honeycomb carrier is distinguished into three abutting regions with a low concentration <sup>↔</sup> ~~of the respective precious metal~~ in the first or upstream region, a <sup>peak</sup> ~~maximum concentration~~ in the second or intermediate region and a third concentration in the third or downstream region which is equal to or lower than the ~~maximum~~ <sup>peak</sup> concentration in the second region.
2. Exhaust gas cleaning catalyst according to claim 1, wherein the total length of the honeycomb carrier is from 30 to 300 mm and the first region has a length of from 5 to 20 mm and the second region has a length of from 10 to 100 mm abutting to the first region.
3. Exhaust gas cleaning catalyst according to Claim 2, wherein the average concentration of the precious metal component with <sup>continuously</sup> ~~varying~~ concentration profile in the first region is of from 10 to 80 % of the maximum concentration in the second region and the average concentration in the third region is of from 0 to 100 % the maximum concentration in the second region.
4. Exhaust gas cleaning catalyst according to Claim 3, wherein the concentration of precious metal is constant within the <sup>several</sup> ~~individual~~ regions.
5. Exhaust gas cleaning catalyst according to Claim 3, wherein the precious metal component with <sup>continuously</sup> ~~varying~~ concentration profile is palladium and its <sup>peak</sup> ~~maximum~~ concentration in the second region is from 0,1 to 100 g/l of volume of the honeycomb carrier.
6. ~~Exhaust gas cleaning catalyst according to Claim 4, wherein the concentration of palladium is continuously varying along the axis of the honeycomb carrier with a minimum concentration at the inlet face of the carrier and a peak concentration > within the second region of the catalyst carrier.~~
7. Exhaust gas cleaning catalyst according to one of the preceding Claims, wherein the catalytic coating further comprises additional precious metal components se-

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lected from the group consisting of platinum, rhodium, iridium or mixtures thereof.

7. <sup>7</sup>  
A8. Exhaust gas cleaning catalyst according to claim <sup>7</sup>, wherein the additional precious metal components exhibit the same concentration profile as palladium but with different absolute concentrations.

8. <sup>6</sup>  
A9. Exhaust gas cleaning catalyst according to Claim <sup>7</sup>, wherein the additional precious metal components have the same constant concentration within all three regions of the catalyst.

9. <sup>8</sup>  
A10. Exhaust gas cleaning catalyst according to Claim <sup>9</sup> wherein the additional precious metal components are platinum and rhodium with platinum and rhodium being present in a concentration of from 0,05 to 5 g/l volume of the honeycomb carrier.

10. <sup>9</sup>  
A11. Exhaust gas cleaning catalyst according to Claim <sup>10</sup>, wherein the catalytic coating with the varying concentration profile forms a first coating on top of which is provided a second catalytic coating and said second catalytic coating comprises the additional precious metal components with constant concentration along the honeycomb carrier.

11. <sup>11</sup>  
A21. Process for manufacturing an exhaust gas cleaning catalyst according to claim 1, comprising

20 a) coating a honeycomb carrier with a slurry comprising at least one high surface area support material for the precious metal component, drying and calcining this coating to obtain a support layer,

25 b) wetting the first region of the carrier with a wetting agent,

c) impregnating the first and second region of the carrier with a solution of at least one precursor compound of the precious metal component,

d) drying the impregnated support layer by conducting a stream of heated air through the honeycomb carrier, thereby forming a continuous concentration profile with a low precious metal concentration at the upstream side, and

30 e) calcining and optionally reducing the precious metal component in a hydrogen containing gas stream.

12.

**A31** Process for manufacturing an exhaust gas cleaning catalyst according to claim 1, comprising

- 5 a) coating a honeycomb carrier with a slurry comprising at least one high surface area support material and a precious metal component, drying and calcining this coating to obtain an already catalytically activated support layer,
- b) wetting the first region of the carrier with a wetting agent,
- c) impregnating the first and second region of the carrier with a solution of at least one precursor compound of the precious metal component,
- 10 d) drying the impregnated support layer by conducting a stream of heated air through the honeycomb carrier, thereby forming a continuous concentration profile with a low precious metal concentration at the upstream side, and
- e) calcining and optionally reducing the precious metal component in a hydrogen containing gas stream.

13.

**A47** Process for manufacturing an exhaust gas cleaning catalyst according to claim 1, comprising

- 15 a) coating a honeycomb carrier with a slurry comprising at least one high surface area support material for the precious metal component, drying and calcining this coating to obtain a support layer,
- b) wetting the first and the third region of the carrier with a wetting agent,
- 20 c) impregnating either the complete carrier with a solution of at least one precursor compound of the precious metal component in one step, or in a first impregnation step the first and second region and in a second impregnation step the third and the second region of the carrier,
- d) drying the impregnated support layer by conducting a stream of heated air through the honeycomb carrier, thereby forming a continuous concentration profile with a low precious metal concentration at the upstream side, and
- 25 e) calcining and optionally reducing the precious metal component in a hydrogen containing gas stream.

14.

**A51** Process according to one of Claims 12 to 14, wherein the wetting agent is water or an aqueous solution of an organic compound.

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<sup>15</sup>  
A61 Process according to Claim <sup>14</sup> 15, wherein the wetting agent is an aqueous solution of an organic compound selected from the group consisting of polyethylene glycol, citric acid, polyvinyl alcohol, isopropanol or mixtures thereof,

<sup>16</sup>  
A7. Process according to one of Claims <sup>11</sup> 12 to <sup>13</sup> 14, wherein the impregnation solution contains a poorly adsorbing precursor of the precious metal component.

<sup>17</sup>  
A81 Process according to Claim <sup>16</sup> 17, wherein the poorly adsorbing precursor compound is palladium tetraammine nitrate  $Pd(NH_3)_4(NO_3)_2$ .

<sup>18</sup>  
A97 Process according to one of Claims <sup>11</sup> 12 to <sup>13</sup> 14, wherein the impregnation solution contains a strongly adsorbing precursor of the precious metal component.

10 <sup>19</sup>  
A10. Process according to Claim <sup>18</sup> 19, wherein the strongly adsorbing precursor compound is palladium nitrate  $Pd(NO_3)_2$ .

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